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Mobile application to provide personalized sightseeing tours

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ABSTRACT

Tourist recommendation systems have been growing over the last few years, mainly because of the use of mobile devices to obtain user context. This work discusses some of the most relevant systems on the field and presents PSiS Mobile, which is a mobile recommendation and planning application designed to support a tourist during his vacations. It provides recommendations about points of interest to visit based on tourist preferences and on user and sight context. Also, it suggests a visit planning which can be dynamically adapted based on current user and sight context. This tool works also like a journey dairy since it records the tourist moves and tasks to help him remember how the trip was like. To conclude, some field experiences will be presented.

1. Introduction

When a tourist goes to a new location (country, city or region), he would certainly like to have a user-friendly tool to help planning his staying according to his objectives, preferences, knowledge, budget and available time. The tasks of planning where to go and what to do, in the limited amount of time available, are common problems encountered by tourists when visiting a city for the first time. In effect, cities are very large information spaces and in order to navigate through these spaces, visitors have available numerous guide books and maps that provide large amounts of information.

Haubl and Dellaert (2004) state that this can be a bless and a curse. Although the amount of information allows tourists to select more appropriately the points of interest to visit, it can also turn the process so complex that the tourist might not be able to assimilate adequately all the given information. A recommendation system helps the tourist narrow the universe of choice, giving results according to his preferences. Also, it processes much more information than the tourist could possibly do.

Mobile devices are very useful to use on a tourism scenario, due to its pocket size and computational capabilities. It can be used to support a tourist on planning his stay, show point of interest's detailed information or recommend nearby points of interest to visit.

However, mobile devices have limited capabilities when compared to a traditional computer, which must be considered because of possible technical, ergonomic or economic implications on the application development. Although in recent years mobile technology has evolved significantly it has yet low performance, mainly on battery life time, which is the biggest obstacle to the growth of mobile performance.

To provide an effective support to the tourist on a trip, a set of factors must be considered including actual available technology, such as connectivity, localization and user interface. Mobile device's wireless capabilities can be slower and with higher latency compared with wired data connections. Also, the use of wireless communications increases a lot the device power consumption. To develop a client–server application for a mobile environment, all of these problems and limitations must be considered to provide an effective and reliable application.

This paper is organized in the following topics. Section 2 presents some of the most important and recent works in the area. Section 3 describes PSiS (Personalized Sightseeing Planning System) architecture and functionalities. In Section 4 PSiS Mobile is compared with the systems presented in Section 2. Some lessons learnt

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and system results are presented in Section 5. Finally, in Section 6, conclusions are exposed, as well as, the future work.

2. Literature review

As the World Wide Web evolved into an incredible huge mass of distributed information, recommendation systems emerged to minimize the time consuming task of searching information on the web. However they present some issues that the most important to tackle is the amount of data that must be processed on the first run. Since recommendations are usually based on already existing data (*e.g.*, user profiles and history), systems need to tackle the cold start problem (Luz et al., 2010).

Although many derived approaches are emerging, recommendation systems are mostly based on three different paradigms: content-based, collaborative and knowledge-based. The content-based paradigm applies to systems that rely on item information to retrieve recommendations. On the other hand, collaborative systems compare similar users to provide recommendations. The knowledge-based paradigm tends to tackle both, content-based and collaborative, systems weaknesses and problems.

Recommendation results can be improved through the use of ontology's (or case-based rules) and a reasoning process, allowing the user to incrementally specify his needs. Since pure recommendation systems contain multiple weaknesses that can usually be tackled by merging different paradigms, hybrid systems have become the current most popular choice, especially when the system needs to deal with highly heterogeneous information. A hybrid approach can involve all the three recommendation paradigms (Luz et al., 2010).

In this section we will present a state of the art with the most significant works in the area, as well as, a bunch of the most recent ones. A more extended state of the art can be seen in some of our previous works (Anacleto et al., 2010, 2011).

GUIDE system (Davies et al., 1999) was one of the first mobile tourism guides and it was designed to guide tourists in the city of Lancaster. The mobile device uses a high-bandwidth, cell-based, wireless infrastructure (WLAN), which is available in all over the city, to locate the tourist (obviating the need for a separate location system like GPS) and to deliver dynamic information (including access to the World Wide Web). The information presented to visitors is tailored based on the visitor's user profile, contextual information and physical location.

Also, based on the current context it suggests a tailored tour which can be dynamically changed based on sights schedule restrictions. The tour can be changed by the tourist since he can agree with the next suggested attraction, or, override this recommendation by selecting a different attraction to be the next destination. Besides the tour, it provides booking facilities.

m-ToGuide (Schneider and Schröder, 2003) was a project targeted for the European tourism market and its objective is to integrate a multidisciplinary mobile tourism service that includes an decision algorithm to provide filtered information from multiple content providers. A portable terminal is used to exchange information between the mToGuide central system and the tourist. This terminal provides the end user with relevant information about the points of interest (maps, text, audio, and visual materials) and gets inputs from him. The terminal uses GPS in order to get tourist location and a GPRS modem in order to communicate with the central system. A novelty of m-ToGuide is the capability to allow transactions.

The system assigns to the user a default personal profile according to the kind of trip (*e.g.*, family trip, business trip) which the user is interested and adapts the contents, creating a tour based on tourist profile and transportation type. The authors claims that this system is useful for multi-day, single-day and hour/single tour usage. A trial project was performed and the results indicated that the system was useful but the charged prices were not well accepted by users.

Deep Map (Malaka and Zipf, 2000) is a mobile system able to generate personal guided tours through the city of Heidelberg (Germany). Such tour considers personal interests, social backgrounds (*e.g.*, age, education and gender) and transportation type. It proposes a 3D-reconstructed building feature that presents how the point of interest was, like a virtual time travel.

Therefore it makes usage of an agent-oriented software architecture. The agent based approach allows an easy re-use of components in different systems that may consist of a different set of agents and thus providing another range of services. This is especially important in this scenario where there are two quite different application platforms: a web-based system for home users and the mobile system for tourists on site. Another important feature is that, usually, normal maps just contain 2D information, however Deep Map includes 3D information to generate route instructions to be like “follow the street and turn right after the big red building and head towards the church”.

CRUMPET (Poslad et al., 2001) was designed to provide individualized information and services to tourists, implemented as a multi-agent system with a concept of a service mediation and interaction facilitation. For each point of interest it presents a description, maps, directions and pictures. In the first use tourists provide demographic information and while they are traveling and interacting with the system, it learns more about user preferences. The points of interest recommendation is based on personal interests and the current location (retrieved using GPS).

It uses a device-aware feature, which tries to choose the best Internet network connection according to their availability. Another interesting feature is the proactive tip, which gives a tip when the tourist gets near a sight that might interest him. The authors claim that in the realized tests the system has been acknowledged by users for its simplicity of use and for its focus on location-based services.

CATIS (Pashtan et al., 2003) is a context-aware tourist information system with a web service-based architecture. The context elements considered by this project are location, time of day, speed, direction of travel, personal preferences and device type. On the first use, the user must enter his preferences to complete his profile. After that, the system will track him with the GPS receiver, if it is available. If not, it will ask the user's current position.

The system implements three adaption capabilities. First is the location and time-based adaption, with this information the system will track tourists position and time to provide information relevant for that constraints. Second, is personal adaptation, the application provides services adapted to users specific profile. At last, there is device adaption, which is the capability to adapt the information according to the user device type, for example, if the device has a certain screen size it may not support some image sizes.

e-Tourism (Sebastia et al., 2008) is a tourist recommendation and planning application to assist users on the organization of a tourism agenda in the city of Valencia (Spain). This project focuses essentially on the trip planning and, besides activities duration, it introduces a new feature which is the use of different visit durations for each point of interest based on the different user's profiles.

The recommendation module offers to the tourist a list of points of interest that are likely of interest to him, based on user demographic classification, past trips and the preferences for the current visit. The planning module schedules this list of recommended places according to the temporal characteristics, as well